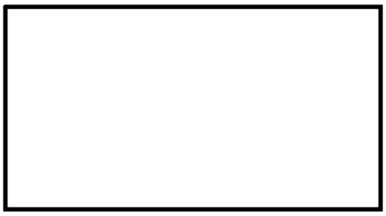
6.3: Multiplication and Division of Rational Numbers

Definition: If $\frac{a}{b}$ and $\frac{c}{d}$ are rational numbers, then $\frac{a}{b} \cdot \frac{c}{d} = \frac{a \cdot c}{b \cdot d}$.

Example: Draw a figure to represent $\frac{1}{2} \cdot \frac{3}{4} = \frac{3}{8}$.



Example: Draw a figure to represent $\frac{2}{3} \cdot \frac{3}{5} = \frac{2}{5}$.

6.3 Notes

Example: Calculate $\frac{27}{62} \cdot \frac{8}{54}$.

Example: Calculate $\frac{18}{44} \cdot \frac{55}{27}$.

6.3 Notes

Fact: The rational numbers over multiplication have the closure, commutative, and associative properites. The following properties also hold.

Identity:

Inverse:

Zero Multiplication Property:

Distributive:

Example: Calculate the following.

(a) $3\frac{1}{3} \cdot 3\frac{1}{3}$

(b) $2\frac{2}{3} \cdot 1\frac{1}{4}$

Definition: If $\frac{a}{b}$ and $\frac{c}{d}$ are rational numbers with $\frac{c}{d} \neq 0$, then $\frac{a}{b} \div \frac{c}{d}$ is the unique rational number $\frac{e}{f}$ such that $\frac{c}{d} \cdot \frac{e}{f} = \frac{a}{b}$.

We will not be studying a model for this in class, but look at p. 390 for some ideas of how to teach this.

6.3 Notes

Example: Show that $\frac{2}{3} \div \frac{3}{4} = \frac{8}{9}$.

Theorem: If $\frac{a}{b}$ and $\frac{c}{d}$ are any rational numbers and $\frac{c}{d} \neq 0$, then $\frac{a}{b} \div \frac{c}{d} = \frac{a}{b} \cdot \frac{d}{c}$.

Proof:

6.3 Notes

Example: Compute $\frac{4}{5} \div \frac{12}{5}$ using Keep Change Flip with one of the explanations from before.